Abstract:
The life histories of several groups of mammals include periods of either short or prolonged bouts of complete food deprivation. These fasting periods are often coupled with specific life-history events including hibernation, mating, molting, and migration. The prolonged fasting to which many animals have adapted could prove detrimental to humans and other non-adapted mammals. However, adaptive fasting is an inherent survival tactic and adaptation, rather than a pathophysiological detriment, and is distinct from starvation. Adaptive fasting strategies are highly variable and dependent on the quantity of endogenous fuel stores. Though the lengths of fasts are variable, the physiological consequences of adaptive fasting are generally classified into specific phases that are driven largely by metabolic responses to loss of ingested nutrients. Given that fasting is also coupled with dynamic changes in endocrine signaling, especially thyroid hormone-mediated cellular events that should tightly regulate energy homeostasis, prolonged periods of food deprivation can also lead to intermittent insulin resistance, which, as a coping mechanism, enables metabolic shifts that spare glucose and lean tissue. Furthermore, alterations in redox signaling can be disrupted, which can potentially lead to the consequences associated with starvation or caloric restriction. Using the elephant seal as a model of adaptive fasting, I will illustrate their remarkable physiology that allow them to tolerate protracted periods of absolute food-deprivation.